Title: Steel Oil Derricks

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STEEL OIL DERRICKS

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Modern oil production methods are not just a means of recovering "black gold," but are organized on a competitive basis, employing the principles of standardization and other economic methods to produce petroleum products at a minimum cost. The development and use of the internal combustion engine created a market for petroleum products that was undreamed of a quarter of a century ago. To recover crude petroleum from the earth at a minimum cost, durable and economical rig equipment is essential.

Wood was universally used for derrick construction during the early history of oil well drilling. As the industry developed the structure of derricks followed the trend of nearly all classes of industrial structures toward all steel assemblies. They have proved to be more economical than wooden derricks because of their ability to stand up under the destructive climatic conditions to which they are exposed and their suitability to the particular kind of work that they are required to do. Steel oil derricks are to be found today in all the important oil and gas fields of the world.

It was necessary that a derrick should be able to be kept in use for a long period of time without frequent shutdowns for repairs; that is, their rate of deterioration must be slow. Steel derricks are practically permanent structures. Because of the nature of the material of which they are constructed, they do not rot in the humid, swampy districts in which they are frequently erected. Although steel alone would corrode under such conditions it is completely protected by a galvanized coating that is impervious to any moisture that would cause the material to rust and fail under heavy loads. It is claimed that the collapse of a properly constructed steel derrick is impossible, even under severe working conditions. Any weak part of the steel structure is easily detected by careful inspection and can be replaced with little productive time loss. Steady production in a producing oil field is a decided advantage. It is an accepted fact in derrick construction that strength and durability can best be secured with steel.

Steel derricks are of two general types: first, structural steel derricks, built with lengths of steel angle irons, securely bolted together; and second, tubular steel derricks, built with lengths of steel pipe, the ends of which are flattened and punched for bolts or else threaded or friction grips provided for holding the parts together. This latter type offers considerably less resistance to the wind per unit width exposed, a serious consideration in some sections of the country where high winds are not uncommon. The structural steel type is designed to withstand a 70 mi. per hr. gale which allows a larger factor of safety.

Tubular steel has greater strength in compression, tension, and shear per unit weight and length than angle iron, but this advantage is to a great extent lost since the pipe is flattened or threaded at the ends which greatly reduces its strength. Friction grips are not dependable for holding the parts of a derrick together since it is subject to so much vibration during drilling operations.

The most common method of fastening the parts of a steel derrick together is by means of steel bolts that are galvanized like the rest of the parts. The joints and the arrangement of the bolts are designed so simply that the derrick can be assembled and taken down as speedily as possible. They are standardized to one size to be interchangeable and are of sufficient strength to withstand any shearing stress to which they may be subjected in any part of the derrick.

A structural steel derrick is designed to support great loads that are applied vertically downward from the crown block at the top of the derrick. The crown block load may be as high as 500,000 pounds and, as it is lowered or hoisted on the cables it will tend to vibrate and be transmitted to the derrick as a distinct shock. This live load is supported by the four legs of the

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A Group of Steel Derricks in a Producing Field

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derrick held in position by stays and cross braces. To carry this load they are designed for a maximum bearing stress of 27,000 lbs. per sq. in. The legs of the derrick are also subject to shearing and tensile stresses. A 79 mi. per hr. wind alone will impose a lateral force of 19.6 lbs. per sq. ft., and the force exerted by the drill stem leaning against the side of the derrick may greatly increase this load. To carry these lateral loads the legs of the derrick are designed to stand 18,000 lbs. per sq. in. in tension and 12,000 lbs. per sq. in. in shear. These allowable stresses are sufficient to carry any load that may be applied to the derrick under average working loads.

Strong as they are, steel derricks still possess a high degree of mobility. They are 100 per cent salvable. The complete derrick can be dismantled and reassembled on a new location in a few days time. The time required to set up a structural steel derrick after the foundations have been placed is twenty man hours or two men working together one ten-hour day. It is particularly desirable for an oil derrick to be of such construction that it can be readily moved to a new location. A firm that is able to quickly set up a derrick in a new field may be able to be the first to bring in a producing well and thus have a decided advantage over their competitors, since the amount of oil obtainable is limited and the first well brought in will get a greater share of it.

In a producing field one of the greatest dangers is from fire. A burning oil well is often so near to other wells and storage tanks that the fire may spread quickly. It is of course a great advantage to have the derrick over the burning well constructed of non-inflammable material so that the rate at which the fire spreads will not be increased by sparks that may be blown about by the wind. A fire may melt off the galvanizing coat of a steel derrick but it will not warp the structural parts to the extent that the derrick cannot still be used. The crown block and other working parts may be rendered useless by the heat of a fire.

In addition to the use of steel in building the derrick proper, steel framing and corrugated iron sheeting are also provided for in most steel derrick designs for the engine house and belt house. All steel working parts are used to great advantage. With increasing standardization of parts and lowering initial cost, steel derricks give promise of being almost universally used in oil fields all over the world.

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